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TAROS AND YAUTIAS; PROMISING NEW FOOD PLANTS FOR THE SOUTH.

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GENERAL CHARACTERISTICS.

The taro (pronounced tah'ro) and yautia (pronounced yow tee' ah) are starchy root crops[1] belonging to the aroid family (Araceæ). They are similar to the potato in food qualities. As a group they are often termed the edible or economic aroids. All are of tropical or subtropical origin, mostly requiring a very long season in which to mature and more moisture than the common crop plants of temperate regions. Some of them are adapted for cultivation in rich and moist but fairly well drained lands in the coast regions of the southeastern United States. They do not thrive in the dry regions of this country where irrigation is practiced.

The taros include the ordinary peltate-leaved elephant-ear and the dasheens. Dasheens have been grown on a small but increasing commercial scale for a number of years in the far South. The dasheen type of taro has proved to be the most valuable for cultivation in the Southern States, and its more important varieties have been treated in detail in a separate paper.[2] This bulletin, therefore, deals mainly

[1] Two earlier publications (now out of print) have dealt with the yautia, one of which also treated of the taro: (1) Barrett, O. W. The yautias, or taniers, of Porto Rico. Porto Rico Agr. Exp. Sta. Bul. 6, 27 p., 4 pl. 1905; (2) Barrett, O. W. Promising root crops for the South. I.—Yautias, taros, and dasheens. U. S. Dept. Agr., Bur. Plant Indus. Bul. 164, p. 7–29, 10 pl. 1910. Besides these there have been several papers dealing exclusively with the dasheen, the most recent of which is Farmers' Bulletin 1396.

[2] Young, R. A. The dasheen; a southern root crop for home use and market. U. S. Dept. Agr., Farmers' Bul. 1396. 35 p., 26 fig. 1924.

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with other good taros and with promising yautias. Like the jack-in-the-pulpit and the calla, also of the aroid family, nearly all of these plants have very acrid leaves. The uncooked corms and lateral tubers (cormels) of most varieties are also acrid, though some are practically free from this principle.[3]

USES.

Different species and varieties of the edible aroids vary considerably in the water content and otherwise in the chemical composition of their corms and tubers. In general, they are comparable to the potato as food, though most of the more desirable sorts contain less water than the driest white potatoes and have a correspondingly higher proportion of nutritive materials. They are considered to be very easy to digest, and in Hawaii taro in a form called "poi," besides being a common article of food, is often prescribed for invalids. The methods of cooking taros and yautias are usually much the same as those used for potatoes. In some varieties the corms only are commonly used for food; in many only the lateral tubers are eaten, while in many others both corms and tubers are used.

In addition to the corms and tubers the young leaves and the leaf-stalks (petioles) of the taros and yautias are cooked and eaten, but because of their acridity they require preliminary boiling for a few minutes with sodium bicarbonate (baking soda).[4] Cooking them also with fat meat without parboiling with soda will usually destroy the acridity; but when cooked by either method the greens should be tasted by the cook or housewife before being placed on the table, to be sure that they are properly and sufficiently cooked. Young leaves not yet open are usually to be preferred for greens, but while the plants are growing rapidly even the fully expanded ones are suitable. The stalks even of older leaves may be used satisfactorily, especially if the skin is peeled off. The same method of cooking as for the leaf blades is employed.

In parts of the world where flowering varieties of taros are grown, the flowers also are sometimes cooked and eaten. They are cooked by the method used for the leaves.

RELATIONSHIP OF THE TAROS AND YAUTIAS.

The taros, of which there are several species, belong to the genus Colocasia. The yautias belong to the genus Xanthosoma and include a considerable number of species, though only a few are economically important. The botany of these genera has been in a somewhat confused state, and for some of the varieties discussed here no attempt is made to use specific names. Following is a key to the vegetative characters, which it is believed will be useful in separating the principal varieties of taros and yautias described in this bulletin.

[3] The cause of the acridity of the aroids, which was long in dispute, seems to have been definitely determined by a series of experiments by Mr. Black, of the Bureau of Plant Industry, to be the raphides, or needlelike crystals, of calcium oxalate which occur in bundles in many of the cells of the plant. See Black, O. F., Calcium oxalate in the dasheen. *In* Amer. Jour. Bot., v. 5, p. 447–451. 1918.

[4] Interested persons are referred to Farmers' Bulletin 1396 for more detailed directions for cooking the greens.

KEY TO GENERA.

Leaf apparently peltate, the basal sinus partly closed---------- COLOCASIA.
Leaf with sinus open to leafstalk---------- XANTHOSOMA.

KEY TO SPECIES AND VARIETIES OF COLOCASIA.

A. Habit of plant lax, i. e., leafstalks spreading from base; blades usually obliquely nodding from the stalks, which are plain yellow-green.
  B. Mature plants 5 to 6 feet high, usually with numerous lateral shoots; tubers elongated; roots and buds deep pink------ *C. antiquorum.*
  BB. Mature plants 3½ to 4½ feet high, with few or no lateral shoots; tubers ovoid; roots and buds white---------- TARO No. 47147.
AA. Habit of plant more compact; leafstalks more or less erect; blades nearly at right angles with leafstalks, which are usually dark green (rarely light green) shaded with maroon.
  B. Leafstalks green to dark green, usually shaded with maroon; roots and buds reddish or rarely white---------- *C. esculenta.*
    C. Leafstalks light green, shaded with maroon only near top; corms and tubers elongated, with purple fibers in flesh- PENANG TARO.
    CC. Leafstalks dark green, usually shaded with maroon below or throughout; corms and tubers usually ovoid, without purple fibers in flesh---------- DASHEEN TYPE.
  BB. Leafstalks yellow-green, very faintly shaded with maroon; roots and bulbs white---------- YELLOW TANYAH.

KEY TO VARIETIES OF XANTHOSOMA.

A. Leaves sagittate; plants 2½ to 6 feet high (rarely 2 feet).
  B. Leaves broadly sagittate; stalks without distinct reddish or purple shading.
    C. Mature plants 4 to 6 feet high; leafstalks plain green; buds of corms and tubers white with reddish tips; flesh white--- ROLLIZA.
    CC. Mature plants 2½ to 3½ feet high; leafstalks green, with narrow pink line on margin of wings of sinus of stalks; buds of corms and tubers pink; flesh of corm yellow---------- NUT EDDO.
  BB. Leaves more narrowly sagittate; stalks with distinct reddish or purple shading.
    C. Mature plants 3 to 4 feet high; leafstalks shaded below with reddish bronze---------- PICA-UNCUCHA.
    CC. Mature plants 2 to 3 feet high; leafstalks shaded below with purple and having yellowish white stripe on wings of sinus of stalk---------- MALANGA COLORÉ.
AA. Leaves hastate; plants 1½ to 2 feet high---------- BELEMBE.

TAROS.

GENERAL DESCRIPTION.

The taros are peltate-leaved plants; that is, the petiole is attached near the center of the blade instead of at the margin. However, this condition is brought about by the partial closing of the original laminar sinus (between the basal lobes of the blade). The suture formed is easily apparent to the eye (Pl. I, fig. 1). The different species and varieties often show marked differences in the degree to which the sinus is closed. A rare variety with the sinus open practically to the point of attachment of the petiole has been observed in Hawaii.

The taro inflorescence,[5] or "flower," consists of a spadix (Pl. II) bearing pistillate and staminate flowers, borne within a rolled spathe

[5] The term inflorescence is used (1) for the disposition of the flowers or flower clusters on the plant and (2) for a cluster of flowers. It is in the second sense, with the inclusion of the spathe, that the word is used in this bulletin.

(Pl. I, fig. 1, and Pl. III, fig. 1). The minute pistillate flowers are on the lower part of the spadix and inclosed by the green tubular portion of the spathe. Above the pistillate area of the spadix the staminate flowers are borne, and beyond these is a sterile appendage of a length varying with the species and sometimes with the variety. The staminate and sterile parts of the spadix are inclosed by the yellowish limb or upper portion of the spathe; the limb is connected with the tube by a close-fitting collar, which effectually separates the pistillate from the staminate flowers. When the pistillate flowers are mature (which is before the staminate ones mature) the inclosing tube of the spathe partly unrolls, so that snails, very small insects, or other animals which might bear pollen from other inflorescences may enter. The tube soon closes tightly again, the limb of the spathe opens more or less widely, and the staminate flowers, exposed to view, quickly mature and shed their pollen. Except in the case of one variety from Java the tube has not been observed by the writer to open sufficiently to expose any of the pistillate flowers to view.

FIG. 1.—Corm of a dasheen (*Colocasia esculenta* (L.) Schott) that has borne several flower stalks in one of the leaf axils. The distortion caused by the production of the stalks and the scar where they were borne are seen slightly above the middle of the corm. (P19420FS.)

Some varieties of *Colocasia esculenta* (L.) Schott, the most important species of taro, seem entirely to have lost the flowering habit, and others flower at very rare intervals. Some, however, flower more or less freely. No record of the setting of seed by taros except in Hawaii has been found. A taro grower there reported in 1913 that he had grown several seedlings, and early in 1919 Gerrit P. Wilder, of Honolulu, stated that he had raised several hundred taro seedlings. An attempt to secure seed by means of hand pollination in Florida was unsuccessful.

The flower stalks of taros (as well as of yautias) are borne by the corms, usually in one cluster of four or five stalks to each corm that flowers. This causes some distortion of the corm, forming a shoulder (fig. 1).

At least four or five species are believed to be included among the scores of edible varieties of taros. The varieties having shown suffi-

FIG. 1.—PLANT OF A WEST INDIAN VARIETY OF THE RED TARO, COLOCASIA ANTIQUORUM, IN FLOWER.

The spreading leaves with large blades and the wide-opening limb of the spathe are characteristic of the varieties of the red taro. At the upper end of the large leaf blade at the right is seen the suture between the united basal lobes. (P8784FS.)

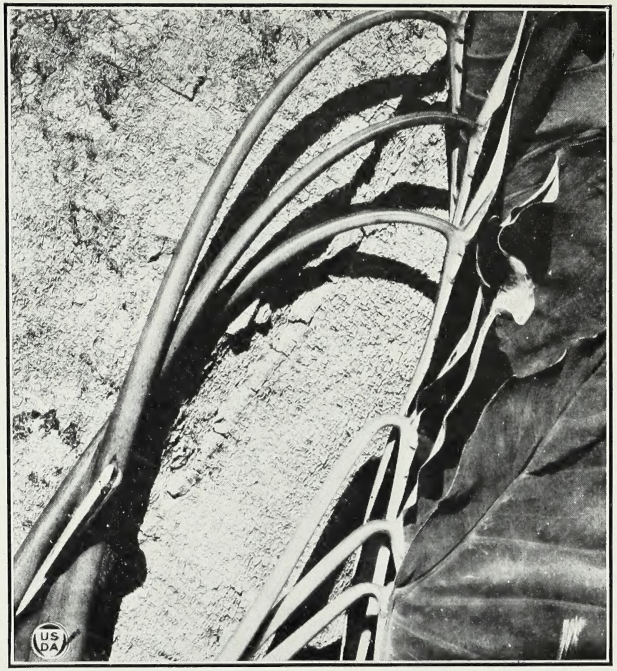


FIG. 2.—THREE LEAVES OF COLOCASIA ESCULENTA (ABOVE) AND THREE OF C. ANTIQUORUM (BELOW).

In *C. esculenta* (the variety shown is the Penang taro) the blade is nearly at right angles with the petiole, while in *C. antiquorum* it forms a much sharper angle. This appears to be a nearly constant difference in all varieties. (P24639FS.)

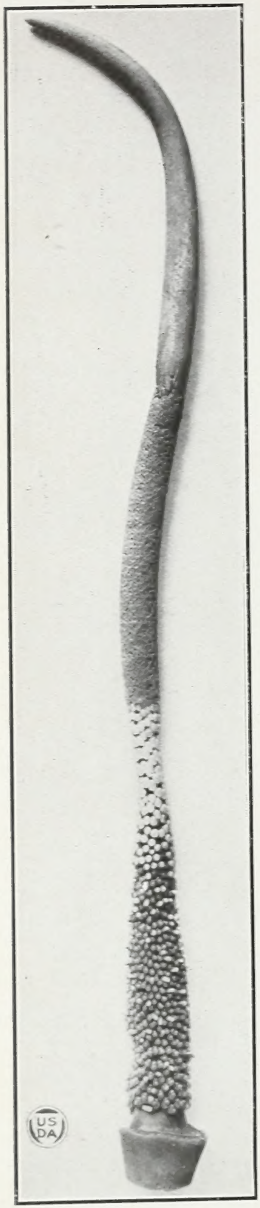


FIG. 1.—SPADIX OF THE BLUE TANYAH.

The lower one-fourth contains pistillate flowers only; next above are aborted flowers compressed by the collar of the spathe; above these are the staminate flowers; at the top is the sterile appendage, one-half longer than the staminate portion. The ratio between the length of the staminate portion and the sterile appendage of the spadix appears to be nearly constant in all the varieties of the true *C. antiquorum*. (Much reduced.) (P14047FS.)

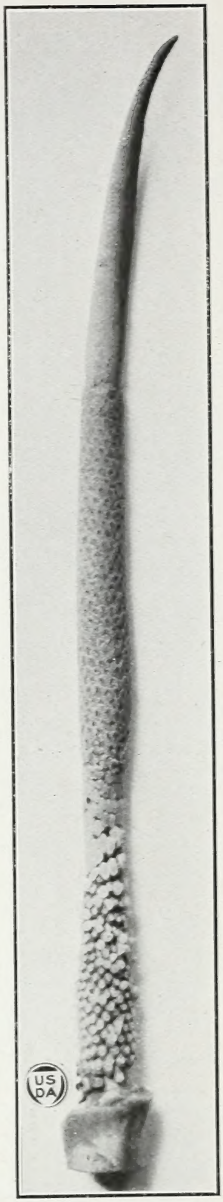


FIG. 2.—SPADIX OF THE YELLOW TANYAH.

The different parts of the spadix are in the same relative positions as in *C. antiquorum*, but the staminate portion and the sterile appendage are of about equal length. This variety is apparently identical with the *Igname branca* (S. P. I No. 19996) of Madeira. (Slightly reduced.) (P14052FS.)

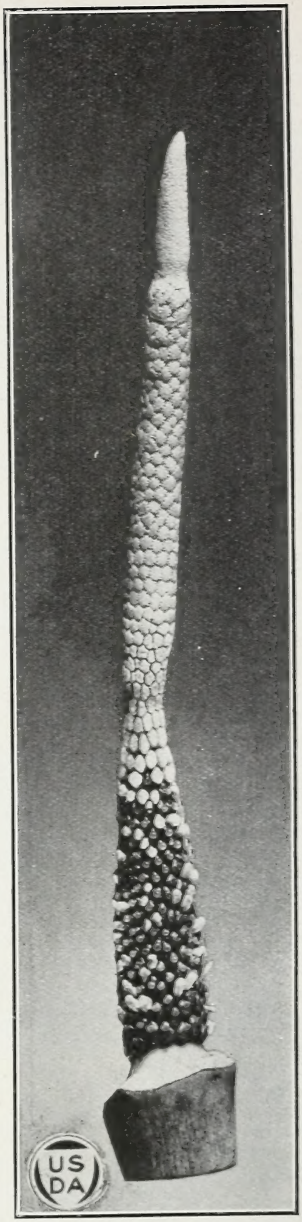


FIG. 3.—SPADIX OF A DASHEEN (TRINIDAD VARIETY), COLOCASIA ESCULENTA.

The spadix is much the same as in Figures 1 and 2 except that the sterile appendage is less than one-half the length of the staminate portion. (Natural size.) (P14057FS.)

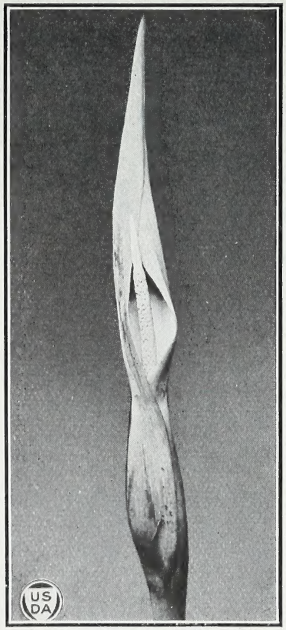


FIG. 1.—INFLORESCENCE OF A DASHEEN.

This form of spathe and spadix is in general characteristic of *C. esculenta*, but it varies more or less with the variety. The sterile appendage is uniformly less than one-half the length of the staminate portion of the spadix in this species. (Much reduced.) (P19890FS.)

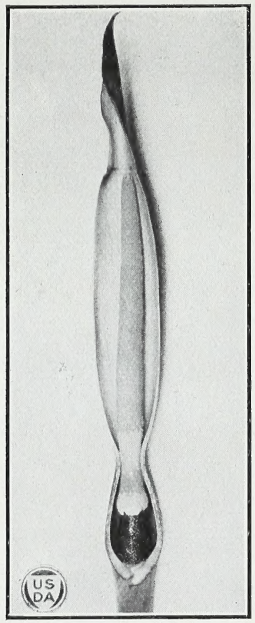


FIG. 2.—INFLORESCENCE OF A YAUTIA, WITH THE SPATHE PARTLY REMOVED.

The dark lower end of the spadix contains pistillate flowers; next to this is a sterile region encircled by the close-fitting collar connecting the tube and limb of the spathe. Above the sterile area the spadix is entirely covered with staminate flowers. (Much reduced.) (P19912FS.)

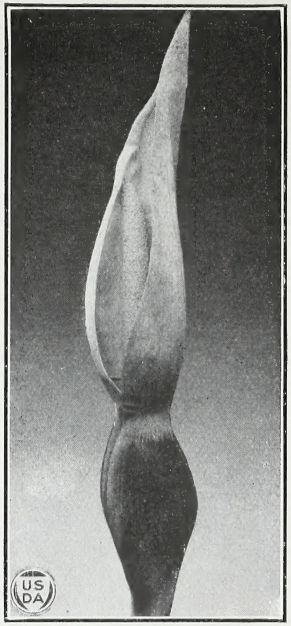
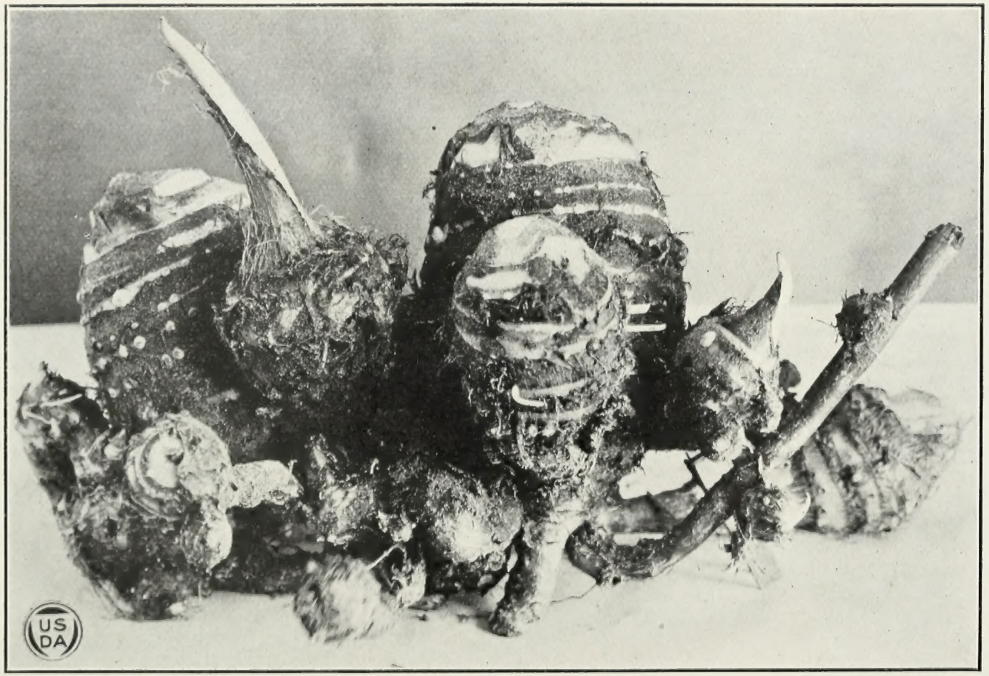


FIG. 3.—INFLORESCENCE OF THE YELLOW-FLESHED YAUTIA CALLED NUT EDDO (S. P. I. NO. 47361), FROM TRINIDAD.

The limb (upper part) of the spathe is forced open somewhat wider than normal, to show the upper (staminate) end of the spadix. (Much reduced.) (P27176FS.)



A 5½-POUND HILL OF CORMS AND TUBERS OF THE RED TARO (VERMELHO), COLOCASIA ANTIQUORUM, OF THE MADEIRA ISLANDS.

Among other varieties of *C. antiquorum* are the common elephant-ear, the blue tanyah of the South, and the culcas of Egypt; these closely resemble the Vermelho. The odd-shaped tubers and the numerous small light-colored buds on the corms are characteristic of all the known varieties of this species of taro. Compare with the corms shown in Figures 2 and 3. (P8905FS.)

cient merit in the Southern States to warrant mention at this time will be considered under the heads of the species to which they belong.

IMPORTANT SPECIES.

Colocasia antiquorum Schott.[6]

DESCRIPTION OF THE PLANT.

This species, which has but few distinct varieties so far as the writer's investigations have revealed, might be called the red taro. A word meaning "red" is used in the name of this taro in Madeira and in at least one locality where grown in China. The skin of the corms and tubers, when the leaves are first removed, is a beautiful deep pink or reddish color; the flesh immediately beneath the skin often is tinged with pink; the young sprouts and the fibrous feeding roots also are pink.

The name "Egyptian taro" also might appropriately be used for *Colocasia antiquorum*, as it has been grown in Egypt since before the time of Pliny (23–79 A. D.), who makes mention of it under the name "colocasia" as one of the established food plants of the country. It is still a crop of considerable importance there, especially among the peasants, under the name "qolqas," or "culcas." The species is cultivated either for food or for its decorative value in most, if not all, of the regions where other taros are grown. The common elephant-ear (often called *Caladium esculentum*) is a variety of it but is seldom eaten.

The corms of all varieties are rough and frequently uneven in shape, and the lateral tubers are mostly too irregular and small for satisfactory table use (Pl. IV). With the exception of a Chinese variety (S. P. I. No. 45777) mentioned on a later page, the forms tested by the Department of Agriculture are usually of inferior quality.

The most evident distinguishing characteristics of the inflorescence of *Colocasia antiquorum* are the wide-opening limb of the spathe (Pl. I, fig. 1) and the very long sterile appendage (Pl. II, fig. 1). This appendage in all the varieties of *C. antiquorum* in the collection grown by the department is approximately one-half longer than the staminate portion of the spadix. The leaves are larger and the plants wider spreading (Pl. I, fig. 1) than in other species of Colocasia, and the blades form a sharper angle with the petiole (Pl. I, fig. 2). The leaves are of a more yellowish green than those of most other taros. In rich moist soil they often reach a height of 6 or 7 feet.

VARIETIES.

Blue tanyah.—The species of the red, or Egyptian, taro is represented in this country by the "blue tanyah" (fig. 9, A and Pl. V, fig. 1) of the coast regions of the Southeastern States, as well as by the elephant-ear. The blue tanyah is the larger and less acrid of the two taros which have been grown locally in the South for food, to a slight extent, for at least two centuries.

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[6] Some doubt has been cast upon the validity of the generic name Colocasia, but as the question is somewhat involved it will not be discussed here. At present Colocasia is generally accepted by botanists.

Vermelho, S. P. I. No. 19997.—The department introduced this variety (Pl. IV) from Madeira in 1906.

Culcas (qolqas), S. P. I. No. 39892.—The true culcas (fig. 2) of Egypt was received from the Department of Agriculture at Cairo in 1915.

Malanga (from Trinidad), S. P. I. No. 30273.—This was introduced in 1911.

In appearance the foregoing are not distinguishable from the elephant-ear. All have proved less desirable than many other taros

FIG. 2.—A medium-sized corm (about natural size) of the culcas, *Colocasia antiquorum* (L.) Schott, received direct from Egypt. Compare the rough surface of this corm with the smoother surface of *C. esculenta* (fig. 1) and that of *Colocasia* sp., S. P. I. No. 47147 (fig. 7). (P20388FS.)

for food purposes. They usually do not cook mealy and are of inferior flavor. Like most taros, the flesh of the varieties of this species becomes somewhat violet colored when cooked, and this fact accounts for the word "blue" sometimes used in the local name of the tanyah mentioned.

Ong-hwa taro, S. P. I. No. 45777.—This variety was received from Mrs. W. M. Loosley, Sienku, Chekiang, China. Although in general the red taro is of rather inferior quality, the Ong-hwa (Mandarin name Hong hwa) as raised in Florida has proved very good. The

full Chinese name, Ong-hwa yü, is translated "red flowery taro." "Red" refers to the reddish color of the fresh skin of the corms and tubers and "flowery" to the fact that the plants flower rather commonly. Most taros in China are understood to flower rarely or not at all. So far, the corms and tubers have been found free from the acridity common to the other edible varieties of *Colocasia antiquorum* tested. When cooked they are mealy, somewhat grayish or violet in color, and of good flavor, much resembling the Trinidad dasheen. In other respects the Ong-hwa variety is practically identical with the other forms of *C. antiquorum* previously mentioned.

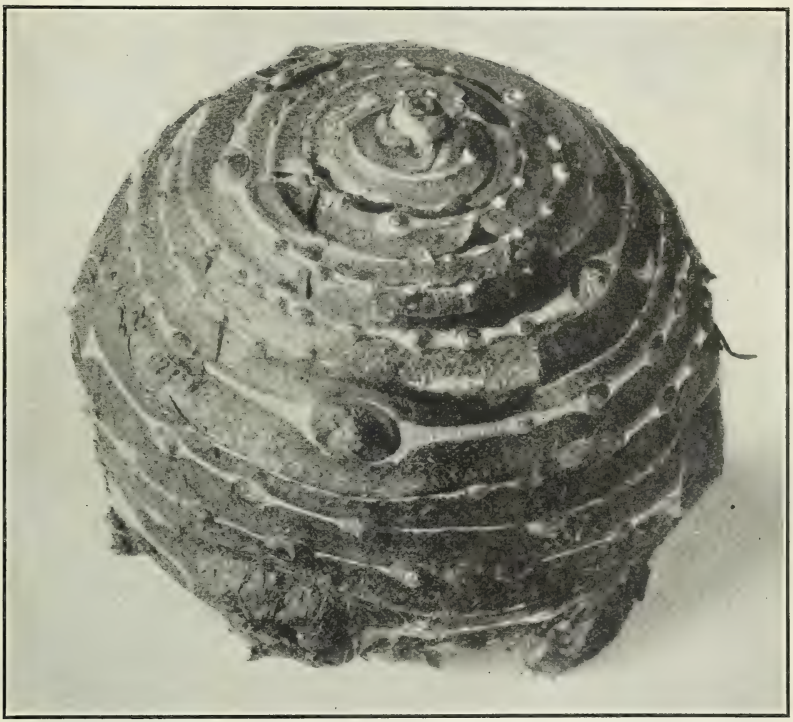

FIG. 3.—Top view of a small corm of the Ong-hwa taro (S. P. I. No. 45777), introduced from China. Although practically identical in appearance with the southern blue tanyah and the Egyptian culcas and belonging to the same species (*Colocasia antiquorum* Schott), the Ong-hwa taro is much superior to those varieties in quality. (P28148FS.)

It deserves trial especially by persons who are accustomed to the use of the blue tanyah of our southeastern coast. A small corm of the Ong-hwa taro is shown in Figure 3.

Colocasia esculenta (L.) Schott.[7]

Under the name of *Colocasia esculenta* are considered here varieties from three different groups of taros, distinct from any of the

[7] In their Meletemata Botanica, vol. 1, p. 18, 1832, Schott and Endlicher tentatively recognized *Arum esculentum* of Linnæus as a good species under the name used here, but in 1856 (Synopsis Aroidearum, p. 40) Schott reduced it to varietal rank. The writer believes that this reduction to a variety was an error resulting from inadequate acquaintance with the growing plants, and he therefore follows the Linnæan distinction. There is great variability, however, in the varieties which the writer includes in *Colocasia esculenta*, and it is possible that further studies will show more than one species to be involved.

varieties of *C. antiquorum*, but resembling each other more or less closely in vegetative characters. The leaves are much more erect (Pl. VI, fig. 1) and the blades form a wider angle with the petiole (Pl. I, fig. 2) than in *C. antiquorum*. As has been mentioned on an earlier page, some of these varieties flower rather freely, while in others flowers are exceedingly rare or unknown; hence their real relationships are not certain in all instances. However, the Hawaiian taros, many of which do flower, nearly all belong here. In Figure 4 is shown a flowering plant of a standard upland variety, Kuoho, grown in the vicinity of Hilo. The limb of the spathe differs somewhat from that of the Trinidad dasheen (Pl. III, fig. 1), but the

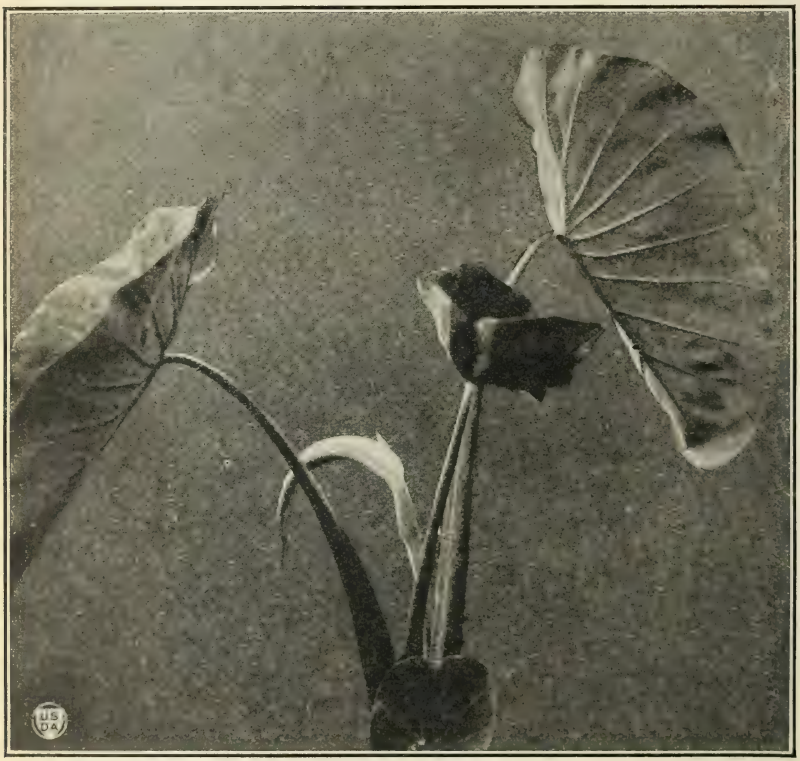

FIG. 4.—The Kuoho taro of Hawaii in flower. The spadix has the short sterile appendage characteristic of *Colocasia esculenta* (L.) Schott. (P11829FS.)

length of the sterile appendage in relation to that of the staminate portion of the spadix is about the same and indicates the specific identity of the two varieties.

DASHEENS.[8]

By far the most important type of taro in this country is that known here as the dasheen (the name being derived from *de Chine*,

[8] In Das Pflanzenreich, Heft 71, IV, 23E, p. 68, 1920, under *C. antiquorum*, a botanical variety *globulifera* is published by Engler and Krause for the dasheen, based on the data given in Bureau of Plant Industry Bulletin 164, "Promising root crops for the South," previously mentioned. The present writer would place this variety *globulifera* under *C. esculenta*.

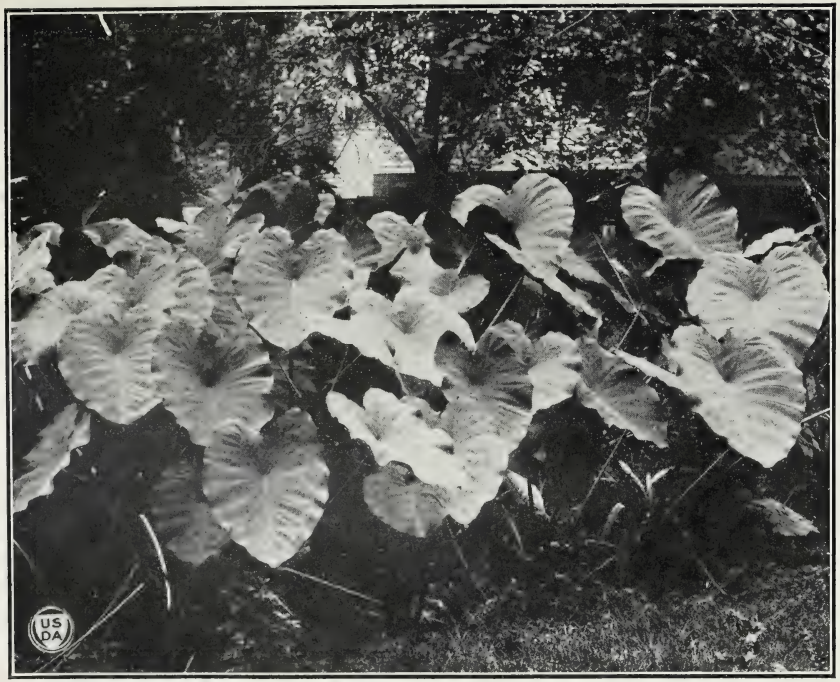

FIG. 1.—PLANTS OF THE BLUE TANYAH, A VARIETY OF THE RED TARO, COLOCASIA ANTIQUORUM, AT SUMMERVILLE, S. C.

This is the pink-rooted tanyah, or taro, the larger of the two kinds grown for two centuries for home use in many localities on the Coastal Plain of the Southeastern States. It is practically identical with the Vermelho of Madeira and the culcas of Egypt. The raw corms and tubers are acrid, but this property is destroyed by ordinary cooking. (P28102FS.)

FIG. 2.—A PLANT OF THE YELLOW TANYAH, COLOCASIA SP., THE SMALLER OF THE TWO TANYAHS, OR TAROS, GROWN IN THE SOUTHEASTERN COAST REGION.

This taro does not appear different in any important respect from the *Igname branca* (S. P. I. No. 19996) of Madeira. (P13878FS.)

FIG. 1.—A PLANT OF THE TRINIDAD DASHEEN, COLOCASIA ESCULENTA, IN FLOWER.

The erect habit of growth, the wide angle formed by the leaf blade with the petiole, and the narrowness of the spathe of the inflorescence when open are characteristic of this species as contrasted with those of *C. antiquorum*. (P12361FS.)

FIG. 2.—A VARIETY OF COLOCASIA ESCULENTA, CALLED SATO-IMO, IN FLOWER IN JAPAN.

This is one of the small-tubered varieties of taro, the flowering of which is exceedingly rare (Photographed by F. N. Meyer; P12362FS.)

meaning "from China"). The dasheens constitute one of several more or less distinct groups of taros belonging to the species *Colocasia esculenta* (L.) Schott. The three most promising varieties of dasheens, the Trinidad, Sacramento, and Ventura, are dealt with fully in Farmers' Bulletin No. 1396; and this group of taros will be mentioned only briefly here.

The Trinidad dasheen (Pl. VI, fig. 1) is the type variety of this group, as it was to this that the name dasheen was originally applied. In the dasheen the tuberous part of the plant consists of one or more large corms, weighing from 1 to 8 pounds each, and from 10 to nearly 100 lateral tubers, ranging from less than an ounce to 10 ounces each. In form the corms range from irregularly oval to nearly spherical; the lateral tubers are usually ovoid, though sometimes elongated or irregular in shape. The best dasheens are dry and mealy, with a delicate nutty flavor when cooked.

S. P. I. Nos. 36057 and 45780.—Two other taros, very similar to each other and much resembling the Trinidad dasheen in appearance, are likely to become of value as the crop increases in importance. One of these, S. P. I. No. 36057, was obtained from Southern Rhodesia. It was reported by the sender, Dr. W. L. Thompson, of Mount Silinda, to be the best of several varieties grown there under the common name "amadumbe." The second variety, S. P. I. No. 45780, was sent under the name Ta-yü (large "yü," or taro) by Mrs. W. M. Loosley, Sienku, Chekiang, China.

These two taros, or dasheens, grow 3½ to 4 feet in height, and the petioles are shaded the entire length with a strongly reddish maroon. The corms are often elongated and usually do not much exceed a pound in weight. They are rather moist, smooth in texture, and of pleasing taste; after a few weeks in storage they become slightly mealy when cooked. The tubers are somewhat oval and seldom weigh more than 3 ounces each; they are even moister than the corms and do not develop the mealy cooking quality. The corms, on account of their smooth texture, are especially suited for salad use; because of the moisture they contain, however, they are often better baked than boiled even for this purpose.

SMALL-TUBERED JAPANESE TAROS.

Several varieties of taros of the dasheen type which have been obtained from Japan, and in some instances also from China, are considerably smaller than those of the Trinidad variety in size of leaf, corm, and tuber (Pl. VII, fig. 1). Some are of rather inferior quality, but a few are very good. Nearly all mature a month earlier than the larger varieties. Flowering is very rare among these taros and, according to report, has never been witnessed by many growers in Japan. A flowering plant is shown in Plate VI, Figure 2.

VARIETIES.

Yatsu-gashira, S. P. I. No. 40805.—This is one of the best of the small-growing short-season Japanese taros. The petioles are blackish maroon except near the leaf blade. The corm is 4 to 6 inches

broad and of good quality, but it is short, multiple headed (fig. 5), and very irregular.

The few tubers produced are oval, usually 2 ounces or less in weight, snowy white when cooked, and of good quality; they are somewhat moist if used soon after harvesting, but become drier and more mealy after a period in storage. The tubers of the Yatsu-gashira keep well. In Japan the variety appears to be valued mostly for the corms, and it is rated as one of the best.

FIG. 5.—Multiple-headed corm (reduced) of the Yatsu-gashira taro (S. P. I. No. 40805) grown in Florida. This is one of the best of the small-growing Japanese varieties. The lateral tubers of this variety are few and usually range from 1 to 2 ounces each in weight. These small-tubered taros mature nearly a month earlier than the Trinidad dasheen and other large-growing varieties. (P25933FS.)

Kinu-katsugi, *S. P. I. No. 45481.*—This variety, also a favorite in Japan, resembles the preceding in size and quality of tubers. The corms are single headed, however, and the petioles plain green.

PENANG TARO, S. P. I. NO. 29327.[9]

The Penang taro (Pls. VIII and IX) is an excellent, fragrant variety of an important type which produces a rather large corm but

[9] The name Penang used here has no connection, so far as known, with the island of that name which lies off the Malay Peninsula, but appears to be a variant rendering of the first two of the three characters, 檳榔芋, of the Chinese name of this variety.

usually only two or three lateral tubers large enough for table use, and these are odd shaped.

The lateral tubers generally are very small and slender and useful only for planting. The corms therefore constitute practically the entire edible crop. The plant is fairly large (Pl. IX, fig. 1), in rich soil reaching a height of 5 to 6 feet. Like related varieties and species, the plant has a great number of fibrous feeding roots (Pl. IX, fig. 2) which, unless they are allowed at first to dry out, are difficult to remove from the corms and tubers when the crop is harvested. The yield is smaller than that of dasheens of the Trinidad type, and the cost of production is therefore greater. An exceptionally large hill, in which a number of secondary corms have developed from lateral tubers, is shown in Figure 6.

FIG. 6.—A large hill of the Penang taro, with the leaves and part of the fibrous roots and soil removed. The central corm in this hill weighed 5 pounds, and eight large tubers (secondary corms) weighed 5 pounds; there were 4 pounds of tubers too small for table use but mostly serviceable for planting. This yield, obtained in very rich soil, is much greater than the average. (P19301FS.)

The Penang is the only variety of its type that so far has proved of value in this country. The first introduction was from Canton, China, through the courtesy of Prof. G. Weidman Groff, of the Can-

Penang is the name which accompanied an introduction of the tubers from Kaying, China. The original introduction was received under the romanized name *Pat-long-fu* (*fu* being the common name for which we use the Polynesian word "taro"). Other romanized names received are: *Paan long heung woo*, *Pan long u*, and *Banlung*. Q. K. Chen, a Chinese student formerly connected with the Bureau of Plant Industry, gave the romanization of the Chinese characters as *Pin nang hsiang ku*, in which *Pin nang* = betel nut, *hsiang* = fragrant, and *ku* = core or tender stalk of a water grass. Another Chinese student thought that the slight resemblance in shape and fibrous covering of the corm of this taro to those of the fruit of the betel-nut palm (*Areca catechu*) might have given rise to the varietal name, and this view seems plausible. However, Prof. G. Weidman Groff, of Canton, feels sure that at present there is no thought of the betel nut in connection with the taro in the minds of the Cantonese who use the name. The selection of Penang from among the forms of the name mentioned, as the American name for this interesting taro, was made for its simplicity and because its use is already familiar to many persons as a geographic term.

ton Christian College. The variety has been received from two different localities in China and from Australia and is known to have been grown to a very slight extent in Hawaii. No record is known of its flowering, and its exact relationships with other varieties having similar leaf characters are therefore somewhat in doubt.

USES.

All parts of the Penang taro plant are acrid, and neither corms nor tubers should be tasted until completely cooked. The methods for cooking are in general the same as for dasheens or other taros. However, on account of its extreme mealiness and, for several weeks after digging, the consequent tendency to cook to pieces in boiling, this taro is not usually suitable for plain boiling or for scalloping until about January 1. The following recipes have been found particularly well adapted for the Penang variety. Baking, as described in the recipe which follows, is one of the best methods of preparation, but attention also is directed especially to the recipes for filling for fowl and for the flaked or granulated taro.

Baked taro.—Clean the dry corm with a brush or coarse cloth, parboil for 10 to 15 minutes (depending on size), and bake in a moderate oven for the same length of time as for a potato of equal size. Cut large corms in half lengthwise to reduce time of baking. Do not overbake. The delicate crust formed on the cut surface of a properly baked corm is particularly delicious. When the taro is done, serve immediately in the "half shell" or remove the skin and serve in flat slices about half an inch thick in a warmed covered dish. Eat with salt and butter or gravy.

Plain boiled.—(Satisfactory only when corms are thoroughly matured, after about January 1.) Boil whole in the skin and when cooked through remove from water at once, dry off in a hot oven for 5 to 10 minutes, and serve immediately. A large corm may be cut in half, peeled, and then cut into smaller pieces—such as the thick, even slices described under baked taro—and served in a warmed covered dish. Eat with salt and butter or gravy.

Taro flakes, or granulated taro.—Use cold taro, boiled or baked the day before. Peel, grind in food chopper with fine adjustment (nut-butter grinder for the flaked form), and sprinkle with salt (nothing else) while grinding; heat rather quickly in chafing dish or in covered dish in hot oven; do not stir. Serve immediately; eat with butter or gravy. Butter or cheese may be added to top after heating and the dish browned quickly in oven and then covered to prevent further drying.

Riced taro.—Boil (or parboil and bake) the taro and peel it. With a strong steel-handled ricer rice the hot taro in layers into a warm covered serving dish, and season each layer with salt. Eat with butter or gravy. A casserole may be used for serving and the top of the riced taro dotted with butter or sprinkled with grated cheese and browned quickly in the oven.

Mashed taro.—Rice the taro as in the preceding recipe, or mash it thoroughly; season with salt and butter, add plenty of heated milk to make beating easy, and beat until very light. The excellence of mashed taro depends upon the use of a proper quantity of milk and the thoroughness of the beating.

Filling for fowl and other meats.—Prepare the filling as usual, but use 2 parts of boiled and riced taro to 1 part of bread. This is equal to chestnut dressing and requires less labor in preparation.

Taro hash.—Prepare from cold boiled or baked taro and meat, seasoning as for ordinary hash. The distinctive flavor of the Penang taro makes this hash especially delicious.

Taro crisps.—Crisps are made from the Penang taro in exactly the same way as from dasheen corms. Pare the uncooked corm without wetting, cut into latticework slices with a strong fluted vegetable slicer, soak for an hour or more in at least two changes of water, and fry slowly to a straw color in deep vegetable fat. A temperature of 180° to 190° C. for the fat has been found most satisfactory.

Creamed.—Boil the taro and while still warm peel, dice small, season with salt, and nearly cover with rich milk. Heat slowly and simmer until the milk is mostly absorbed. No flour is used, since sufficient starch to thicken the milk is drawn from the taro.

Scalloped taro.—Use raw taro, pared dry. Cut slices an eighth to a quarter inch thick, and proceed as for scalloped potatoes. Sprinkle cracker meal or bread crumbs and a little sugar on each layer in addition to the usual seasoning. Less time is required in cooking than for scalloped potatoes.

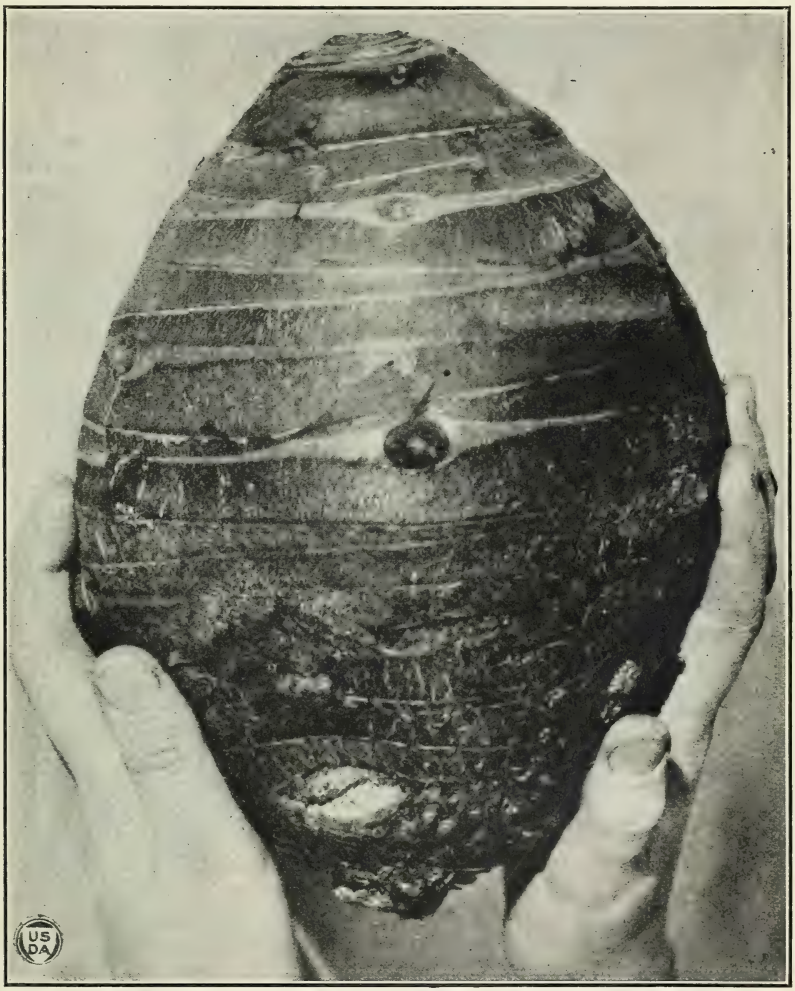

FIG. 7.—A 5½-pound corm of a taro, S. P. I. No. 47147, grown in central Florida. This taro is too moist for satisfactory table use when first harvested and has less flavor than some varieties, but it is improved by a period in storage. For baking it is a good variety for use after midwinter. It is a good keeper. (P24827FS.)

Taro scalloped with cheese.—Proceed as for scalloped taro, but less butter and no sugar should be used, and grated cheese should be added to each layer, with bread crumbs on the top layer.

Taro sauté.—Boil the taro until done. Peel, slice (warm or cold) into rather thick, even slices, sprinkle with salt and sauté (fry in small amount of fat) quickly, one layer deep, in a covered frying pan. Remove from fire immediately when only slightly browned, to avoid excessive drying, and serve

at once. If desired, after salting, the slices may be sugared liberally and then sautéed.

French fried taro.—Pare the dry raw taro, cut into square strips, and fry to a straw color (not brown) in deep fat. Serve immediately. Previously boiled or baked taro also may be fried in the same manner.

Colocasia Spp.

Two very different types of taro, for neither of which a specific name is at present definitely known, are considered here.

S. P. I. NO. 47147.

Under this number the Department of Agriculture is propagating and sending out an unidentified taro which promises to become of considerable importance. A single plant of it, unlabeled, was found in the taro collection at the Plant Introduction Garden at Brooksville, Fla., in the fall of 1912. Efforts to determine its identity or origin thus far have been unavailing but ultimately must succeed. The variety has not flowered, so far as known. The vegetative characters are such as to leave even its specific identity in doubt, though it seems to show affinities with *Colocasia esculenta*. The growing plant (Pl. VII, fig. 2) is characterized usually by an entire absence of the lateral shoots with which the main plant is surrounded in most taros; in other words, the lateral tubers rarely sprout. The entire leaf is yellow-green, the petiole being lighter than the blade.

FIG. 8.—An averaged-sized lateral tuber of a taro, S. P. I. No. 47147. These tubers retain their whiteness when cooked, but because of a rather high moisture content they are not satisfactory for table use until at least a month after they are dug. They are better suited at all times for baking than for any other method of cooking. They keep well and are especially valuable for use after midwinter. A neck similar to the one at the base of the tuber shown is common in this variety, though it is sometimes absent. (P13855FS.)

The corm (fig. 7) of S. P. I. No. 47147 is larger and more even in form on the average than that of the Trinidad dasheen. The number of tubers in a hill is usually from 10 to 30; they vary less in size and shape than in the Trinidad dasheen, but they are rather small and frequently somewhat necked at the base (fig. 8). The young leaf sprouts and the fibrous roots are white. When cooked, the tubers usually remain perfectly white and the corms nearly so, though sometimes the corms darken considerably and may not become mealy. Both are much more moist than the Trinidad dasheen and are less rich in flavor. For these reasons they are not generally satisfactory for table use for a month or more after

they are dug, and even then they are much better baked than when cooked in other ways. However, after being baked they may be fried or otherwise prepared further. Later in the season the corms may be boiled, but the tubers are always much better baked.

The whiteness, excellent texture, and mild flavor of the baked tubers of this taro have made it a favorite with a good many persons who at first objected to the dryness and the frequent violet coloration of the ordinary dasheen. From the point of view of the grower, the variety has an advantage in the greater ease of harvesting and preparation for market because the absence of leaf sprouts from the tubers reduces the labor of cleaning. The variety also is an excellent keeper. However, it is not recommended for commercial cultivation at present, for, as indicated, the variety of uses

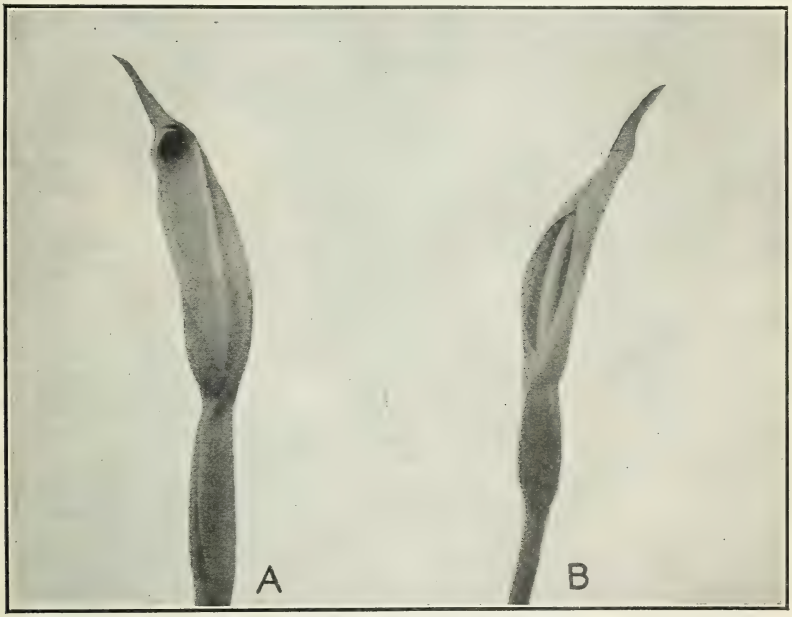

FIG. 9.—Inflorescences of the two tanyahs (taros) of the South Atlantic coast region: A, The blue tanyah, *Colocasia antiquorum* Schott. B, The yellow tanyah, *Colocasia* sp. The limbs of the spathes are respectively open to the normal full extent. (P24365FS.)

on the table is limited, and it would prove unsatisfactory on the market unless handled in the special ways described.

YELLOW TANYAH.

This taro is the smaller and more acrid of the two "tanyahs" of our southeastern coast region. The word "yellow" in the local name has reference to the slightly yellowish color of the flesh when cooked. The name "tanyah" alone is used in localities where the blue tanyah (*Colocasia antiquorum*) is not also grown. The young sprouts and fibrous roots of the yellow tanyah are white, making it easy to distinguish from the larger growing pink-rooted blue tanyah. The inflorescence differs from that of the blue tanyah and

other varieties of *C. antiquorum* in being somewhat smaller, in having the limb of the spathe open much less widely (fig. 9, A and B), and in having the sterile appendage of the spadix (Pl. II, fig. 2) approximately equal to the staminate portion in length, instead of one-half greater. In comparison with *C. esculenta* (Pl. II, fig. 3), the appendage of the spadix is considerably longer, both actually and relatively, than in the latter species.

FIG. 10.—A 1-pound corm (four-fifths diameter) of the southern yellow tanyah. *Colocasia* sp. This variety of taro, although having a pronounced flavor, is of good quality when thoroughly cooked. The uncooked corms and larger tubers are intensely acrid, however, and require at least two hours' boiling to destroy this property. The variety is identical with the Igname branca (S. P. I. No. 19996) from Madeira. (P24849FS.)

The plant (Pl. V, fig. 2) grows 4 to 5 feet in height. It is plain green, with faint but broad longitudinal bands on part or all of the length of the petioles. The corms (fig. 10) seldom reach a pound in weight. They and all the lateral tubers that send up leaf shoots are extremely acrid and require boiling for at least two hours to become edible. When cooked they are firm but fairly mealy and are of rich though rather pronounced flavor. They are usually pared before being boiled but may be boiled in their skins. The few small tubers that do not send up leaves are usually free from acridity and are whiter and moister than the others when cooked, but they are somewhat lacking in flavor. Like the blue tanyah, the yellow variety is believed to have been grown in the South Atlantic coast region for more than 200 years. Its failure to come into more general use in the localities where grown is doubtless due to the great acridity of the corms and larger tubers, the limitation of their utility because of the long cooking required, and their pronounced flavor.

IGNAME BRANCA.

The igname branca, S. P. I. No. 19996 (white igname or taro), obtained from Madeira in 1906, is practically identical with the

FIG. 1.—A 10-POUND HILL OF ONE OF THE SMALL-TUBERED JAPANESE TAROS BELONGING TO COLOCASIA ESCULENTA.

The soil and most of the fibrous roots have been removed, but the tubers are still clustered just as they grew. The corm, which is small, is hidden by the tubers. The better varieties of this type of taro produce less heavily than the one illustrated. (Reduced.) (P8908FS.)

FIG. 2.—A SMALL PLANT OF TARO, S. P. I. NO. 47147, COLOCASIA SP.

This taro, of unknown name and origin, resembles the dasheen in producing a number of oval lateral tubers of suitable size for table use. As in the case of the plant shown, these tubers usually do not send up leaf shoots. (P11921FS.)

A 7-POUND CORM OF THE PENANG TARO.

This corm is larger and somewhat more elongated than usual, but otherwise is typical of the variety. The Penang taro is dry and very mealy when cooked and has a distinctively delicious aroma and flavor. It produces but few lateral tubers of edible size. The uncooked corm and tubers are acrid. (P14095FS.)

FIG. 1.—A PLANT OF THE PENANG TARO 5½ FEET HIGH IN MIDSUMMER IN CENTRAL FLORIDA.

The Penang is one of the best flavored of all taros. It requires a somewhat longer season than other varieties that are successfully grown in the South. (P19910FS.)

FIG. 2.—PLANTS OF THE PENANG TARO AFTER BEING LIFTED WITH SHOVELS.

These plants, like those of most of the edible aroids, have a multitude of fibrous feeding roots which, unless the tops have previously died down, firmly hold a large quantity of soil when the plants are lifted. In the row on the right the soil has been shaken from the roots, but the corms and tubers are still hidden by the roots. (P19281FS.)

FIG. 1.—VIEW AT THE EDGE OF A FIELD OF YAUTIAS IN DRAINED MUCK SOIL IN SOUTHERN FLORIDA.

As is evident in the plants shown, the basal lobes of the yautia leaf are not united, as in the taros. (P23551FS.)

FIG. 2.—A HILL OF THE ROLLIZA YAUTIA, XANTHOSOMA CARACU, WITH SOIL AND FIBROUS ROOTS REMOVED AND SHOWING THE CORM AND TUBERS IN NATURAL POSITION.

This hill is of rather small size because of a short growing season. Yautias require a longer season than dasheens. In food value they are much like the dasheen and other similar taros. The Rolliza is among the best of the white-fleshed yautias. The lateral tubers retain their whiteness and are dry and firm but mealy when cooked. The corm is coarse and strong flavored and is not used for the table. (PS902FS.)

yellow tanyah. The small lateral tubers that do not send up leaf shoots are said to be those most prized for food in Madeira. Being at most only slightly acrid they do not require so long cooking as the corms and larger tubers. As in the case of the yellow tanyah, however, these small tubers are few and are not rich flavored.

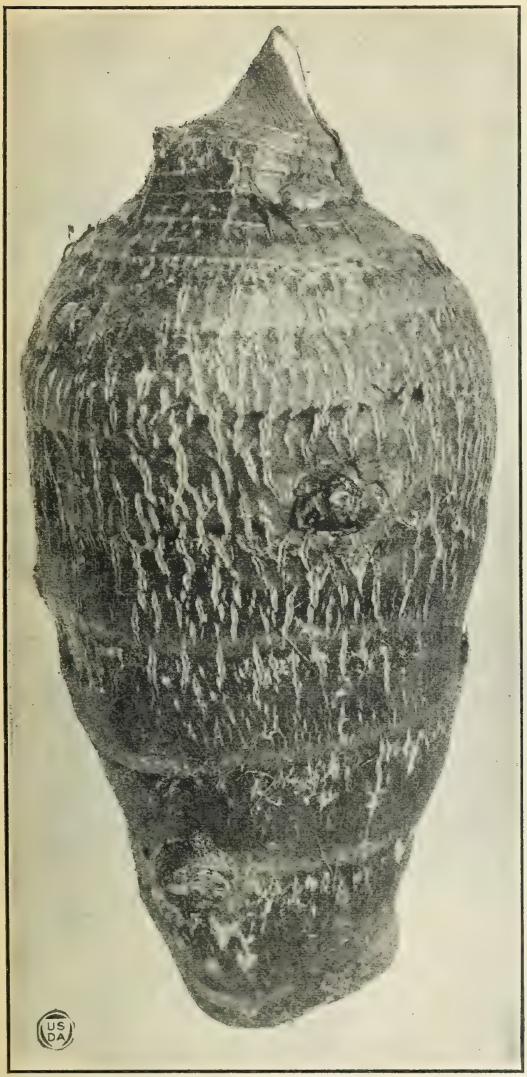

FIG. 11.—A 7-ounce tuber (natural size) of a white-fleshed yautia of excellent quality, similar to the Rolliza variety; grown in southern Florida. (P28193FS.)

YAUTIAS.

GENERAL DESCRIPTION.

The yautias, as previously stated, belong to the genus Xanthosoma and comprise a number of species. Most of the species have large spreading leaves with more or less arrow-shaped blades (Pl. X, fig. 1). The limb of the spathe of the inflorescence varies in length, color, and in the degree to which it opens; the upper end of the spadix (Pl. III, fig. 2) always bears staminate flowers to its tip. Many of the edible varieties seldom or never flower, a trait which makes determination of the species difficult. No attempt is made in this bulletin to use specific names for the varieties of yautias except where their correctness seems to be beyond reasonable doubt. The name "yautia" is said to be an Arawak word,[10] in use in the Greater Antilles at the time of the arrival of the Spaniards.

Most of the better yielding yautias have inedible acrid corms which bear edible lateral tubers. In many varieties the uncooked tubers are also more or less acrid, but in a few they are nonacrid. These tubers as grown in the Southern States usually range from 12 ounces downward in weight (fig. 11);

[10] Barrett, O. W., Promising root crops for the South, previously mentioned, p. 10.

but where there is a very long growing season, as in the Tropics, single tubers weighing considerably more than a pound may be produced (fig. 12). In Figure 13 is shown a hamper of yautia tubers grown in extreme southern Florida in a season in which potatoes on adjoining land completely failed because of frost and excessive rains.

Yautias are baked, boiled, fried, and cooked in most of the other ways in which potatoes or dasheens are prepared. Slight modifications in method are often necessitated, however, by differences in the moisture content and texture of the flesh.

FIG. 12.—An exceptionally large yautia tuber received from the West Indies. It is 8 inches in length, 3 inches in greatest diameter, and weighs more than $1\frac{1}{2}$ pounds. A long growing period is required to produce tubers of this size. (P27223FS.)

IMPORTANT SPECIES.

Xanthosoma caracu Koch and Bouché.[11]

ROLLIZA YAUTIA, S. P. I. NO. 14471.

The Rolliza[12] yautia is understood to occur in slightly varying forms in several countries of northern South America and Central America, in Mexico, and in many islands of the West Indies. It is one of the best of the yautias, having cylindrical or club-shaped white-fleshed tubers of good size. The tubers retain their whiteness when cooked and are of excellent quality. The corms are not suitable for human food, but are cut into pieces and used for replanting or may be cooked and fed to stock. An entire hill of Rolliza yautias with soil, roots, and leaves removed is shown in Plate X, Figure 2.

The plants have broad, spreading leaves and grow from 4 to 6 feet in height under favorable conditions. The margins of the basal lobes of the leaf often blend with the basal veins for an inch or more near their attachment to the petiole, leaving part of the veins exposed next to the leaf sinus. The petiole is green with recurved sinus

[11] The use of this specific name for the Rolliza yautia is in accord with the usage of A. Engler in Das Pflanzenreich, Heft 71, IV, 23E, p. 52, 1920.

[12] Pronounced Roll yeé sa.

wings and a mauve line running along the margin of each wing. The sinus of the petiole is the inside of the concave lower portion through which the next succeeding leaf has come.

Xanthosoma Spp.

VARIETIES.

Pica-uncucha, S. P. I. No. 41120.—This yautia, received from Santa Ana, Peru, produces red-skinned tubers (fig. 14) of good shape which weigh from 4 to 8 ounces each. They are very acrid when raw and require thorough cooking, but the quality is very good. The

FIG. 13.—A hamper of yautia tubers grown on rich hammock land in southern Florida. Potatoes planted on the same kind of land adjoining were more seriously injured than the yautias by frost. Flooding which killed potatoes did not appear to injure the yautias. (P26067FS.)

corms are not edible but are used for propagation. At Brooksville, Fla., where the variety has been tested in the field, the plants grow only 3 to 3½ feet high, but several good tubers are borne in each hill. The Pica-uncucha deserves to be grown at least for home use wherever it will thrive.

Malanga coloré, S. P. I. No. 34854.—This variety, received from Guadeloupe, West Indies, represents a dwarf type of rather long season yautias, of which the corms are eaten. As grown experimentally in Florida, the lateral tubers are too small for table use. The corms never grow to large size, and hence the yautias of this group are light producers. The flesh is yellowish or orange and usually of excellent quality, and varieties of this type are highly esteemed wherever grown in the West Indies. On account of their slow and rather weak growth it is not likely that they will prove adapted for commercial cultivation in this country, except possibly in southern

Florida; but for home use they probably can be grown successfully a little farther north. They will add a pleasing variety to the home table. A description of the plant of Malanga coloré follows:

Height 2 to 3 feet; leaf blades narrowly sagittate, acuminate, petioles glaucous green shaded below with purple, with wings of petiolar sinus deep mauve inside and out, margined irregularly with a yellowish white line. Corms small, elongated, with yellowish flesh that is fairly mealy and of rich flavor when cooked; lateral tubers too small for table use.

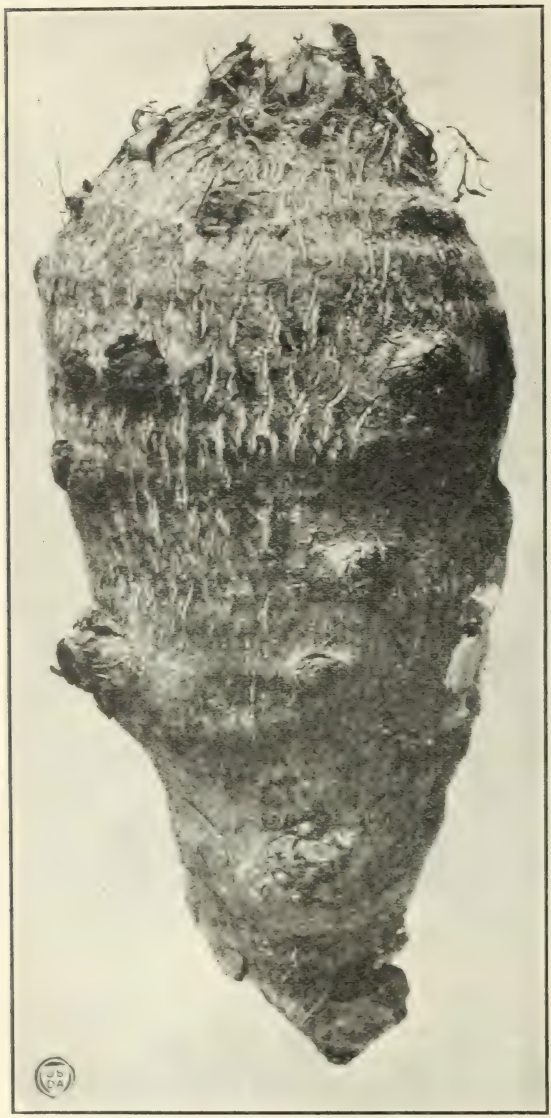

FIG. 14.—Tuber of the yautia called "Pica-uncucha" (natural size), received from Peru. It is very acrid in the raw state, but the acridity is destroyed in cooking, and the quality is very good. The variety produces tubers of good size in Florida and promises to be one of the best yielding of the yautias. (P19209FS.)

An unnamed related variety (S. P. I. No. 46030) received from San Juan, Porto Rico, differs from Malanga coloré only in having the wings of the petiole margined with pink, with an irregular greenish white (instead of yellowish white) stripe next to the pink.

A corm imported from the West Indies and bought under the name "Malanga amarilla" (yellow malanga or yautia) on the market in a suburb of Tampa, Fla., is shown in Figure 15. This is representative in general appearance of these yellow yautias, of which the corms are eaten.

Nut eddo, S. P. I. No. 47361.—This yautia, received from Trinidad, has yellow-fleshed corms somewhat similar to those of the preceding varieties. The buds are pink. The plant is 2½ to 3½ feet high. The leaf blade is broadly sagittate with acute apex; the sinus is much narrowed by the broad basal lobes, and the basal veins are naked only one-eighth inch. There is a prominent marginal vein one-eighth to one-fourth inch from the

margin of the blade and a secondary vein about one-sixteenth inch from the margin. The petiole is green throughout with a narrow pink line on the margin of the sinus wing. The Nut eddo occasionally flowers in Florida. A flower stalk is shown in Plate III, Figure 3. The pistillate flowers are greenish, the sterile staminate (those compressed by the collar of the tube of the spathe) pink, and the fertile staminate ones ivory white.

Xanthosoma brasiliense (Desf.) Engl.

BELEMBE, S. P. I. NO. 15412.

Belembe[13] is one of the Porto Rican names of this species of yautia, which is grown exclusively for greens. In other parts of tropical America it is known by different names, as, for example, "Indian kale." Like the dasheen and most other aroids belembe leaves (fig. 16) are somewhat acrid in the raw state, and in being prepared for the table they must either be cooked with fat meat or be parboiled for 6 or 8 minutes with a little baking soda in the water. They cook quickly, and a total period of 12 minutes is usually sufficient. When parboiled with soda the second boiling is in plain salted water. Except when cooked with meat, a little butter is best used with other seasoning when the greens are served.

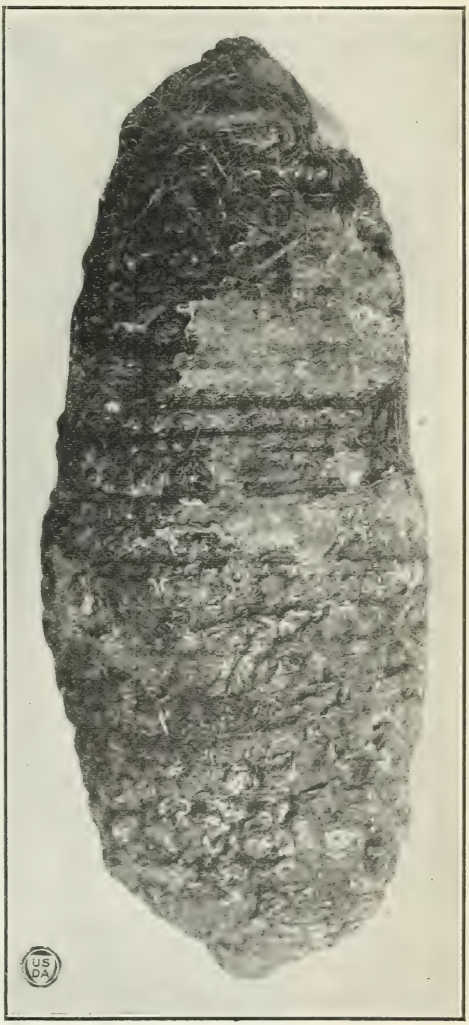

FIG. 15.—Edible corm of a yellow yautia. (Natural size.) In this type of yautia as grown in Florida the lateral tubers are too small for table use. The corms are small, yellow fleshed, and usually of excellent quality. The specimen shown (somewhat shriveled) was imported from the West Indies under the name Malanga amarilla. (P6115FS.)

The particular value of belembe lies in the fact that it will furnish greens for home use in the South throughout the hot summer and early fall months, when vegetables for this purpose are scarce or lacking. The greens have a rich but delicate flavor seldom found in similar dishes. Belembe can doubtless be marketed locally when it becomes better known.

[13] Used by O. W. Barrett in Bureau of Plant Industry Bulletin 164, previously mentioned, p. 24. In a letter of more recent date, Mr. Barrett states that "belembe" is an Arawak word.

During the building of the Panama Canal large quantities were consumed by the Americans stationed in that vicinity.

The plant does best in rich and somewhat clayey loam. It grows from 18 to 30 inches high (Pl. XI, fig. 1). Tubers are planted in the spring, 1½ or 2 by 3 feet apart, and the crop of corms and tubers is dug in the fall. The tubers are mostly very small and are loosely attached to the corm or to other tubers. They and the corms are practically nonacrid, have yellowish flesh, and are edible when cooked, but on account of their small size (Pl. XI, fig. 2) they are seldom eaten.

FIG. 16.—Characteristic hastate leaves of belembe, or Indian kale. (Much reduced.) When properly prepared, these leaves make one of the richest flavored and tenderest of greens. (P8814FS.)

SUMMARY.

The taros and yautias, root crops belonging to the genera Colocasia and Xanthosoma, respectively, are the principal groups of the edible or economic aroids. Several species of each genus are of considerable importance as food plants in various parts of the Tropics and Subtropics, and certain varieties of some of these have proved adapted for cultivation as annual crops in the southern United States. The two "tanyahs" of the southeastern coast regions and the dasheen are varieties of taro.

As food, the corms and tubers of the taros and yautias are comparable with the potato, though on account of being drier most of the

FIG. 1.—ROW OF BELEMBE PLANTS IN FLORIDA.

Belembe leaves when cooked so as to destroy their acridity make most delicious greens. Growing well above the ground and being comparatively smooth, the leaves are less likely than spinach to have sand on them when gathered for use. The plants shown are in rich soil and are from 24 to 30 inches high. (P26270FS.)

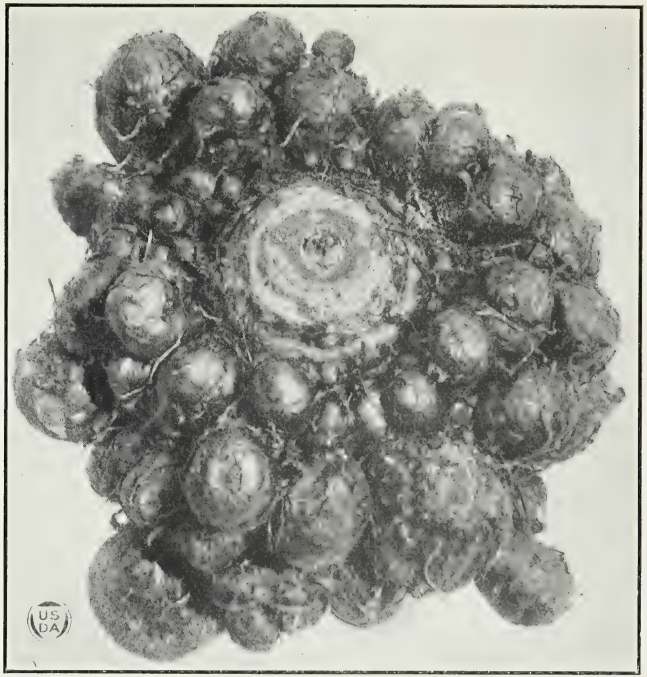

FIG. 2.—A CORM WITH ATTACHED TUBERS FROM A HILL OF BELEMBE.

The plant is grown exclusively for its leaves, the corms and tubers being too small for table use. Most of the tubers are from the size of chufas downward. (Natural size.) (P24823FS.)

better kinds contain much higher percentages of starch and protein. Maturing in the fall or early winter, when home-grown potatoes are scarce, these new crops have high potential value for the far South. The young leaves of all varieties, after being cooked by special methods to destroy their acridity, are eaten as greens. The flowers also may be cooked and eaten.

The taros are all peltate-leaved plants. *Colocasia antiquorum* Schott and *C. esculenta* (L.) Schott are the principal species. The former, which may be called the red taro, includes the culcas of Egypt, the blue tanyah (the pink-rooted variety) of the South Atlantic coast, and the common peltate-leaved elephant-ear of the garden. The last-named variety is seldom used for food. The Ong-hwa taro, recently introduced from China, is the best in quality of all the varieties of the red taro tested in this country. *C. esculenta* includes the dasheen and most of the taros of the Pacific islands and the Orient. The latter species is more important than *C. antiquorum*. The Penang taro, from China, considered a variety of *C. esculenta*, is one of the best in quality of all known taros, but is not so good a keeper as many others.

There are several small-growing short-season taros belonging to *Colocasia esculenta*. Among the best of these tested in the South are the Yatsu-gashira and the Kinu-katsugi of Japan.

A variety of taro of unknown origin, grown under S. P. I. No. 47147, somewhat resembles the dasheen and possibly belongs to *Colocasia esculenta*. It is much more moist than the dasheen but becomes drier in storage, and for baking it is especially valuable after midwinter. The variety is an excellent keeper.

The yellow tanyah, the smaller white-rooted taro of the Southeast, is believed to belong to a different species. Although it has been grown in that region for two centuries or more and is of rather rich flavor, the necessity for long cooking has prevented its becoming generally popular, even where grown.

The yautias have large arrow-shaped leaves. The corms of most kinds are not suitable for food, only the lateral tubers being used. The best known variety of this type is the Rolliza, belonging to *Xanthosoma caracu* Koch and Bouché. This and a pink-skinned variety, Pica-uncucha, of another species, are among the best that have been found adapted to conditions in Florida.

Some yautias have edible corms with tubers too small or otherwise unsuited for table use. Among these are the Malanga coloré, Malanga amarilla, and the Nut eddo of the West Indies. The corms are yellow fleshed and of excellent quality but small, and the plants are not strong growers. It is believed that they can be grown commercially in southern Florida, however, and already there is a demand for them in cities having a large West Indian population.

A yautia, *Xanthosoma brasiliense* (Desf.) Engl., known in some parts of Porto Rico by the Arawak name "belembe," is grown for its leaves only. They are used as greens, and when properly cooked make one of the most delicious dishes of the kind.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

August 18, 1924.

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